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UCRL-CONF-200843

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November 7, 2003

MRS Spring Meeting
San Francisco, CA, United States
April 12, 2004 through April 16, 2004

This work was performed under the auspices of the U.S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48.

Submitted to MRS Spring Meeting
April 12-16, 2004
Abstract #73984

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The effects of potential microbiologically influenced corrosion (MIC) on candidate packaging materials for nuclear waste containment are being assessed. Coupons of Alloy 22, the outer barrier candidate for waste packaging, were exposed to a simulated, saturated repository environment (or microcosm) consisting of crushed rock (tuff) from the Yucca Mountain repository site and a continual flow of simulated groundwater for periods up to five years at room temperature and 30 ^{0}C. Coupons were incubated with YM tuff under both sterile and non-sterile conditions. Surfacial analysis by scanning electron microscopy of the biotically-incubated coupons show development of both submicron-sized pinholes and pores; these features were not present on either sterile or untreated control coupons. Room temperature, biotically-incubated coupons show a wide distribution of pores covering the coupon surface, while coupons incubated at 30 ^{0}C show the pores restricted to polishing ridges.

Solubilized metal from the coupons and contributions from the tuff and growth media were identified with inductively coupled plasma-mass spectrometry (ICP-MS). A seven to sixteen fold elevation in Mn concentration was detected in the non-sterile microcosm reactors incubated at 30 ^{0}C (617 ppb), compared to the background media (0 ppb), non-sterile no-metal control microcosms with tuff (86 ppb), and sterile control microcosms (38 ppb). It is evident that the majority (>80%) of solubilized Mn in the non-sterile reactors was derived from the Alloy 22 coupons due to microbial activity. In addition to biological solubilization of Mn from Alloy 22, a low concentration of Mo (10 ppb) that originated from the Alloy 22 coupons was also found in the non-sterile, biotic microcosm effluent. Mo was not found in aqueous effluent from parallel sterile or no-metal control microcosms. Ion chromatography, to identify soluble salts including nitrate concentration, did not show any remarkable changes between influent and effluent concentrations. Based on the effluent chemistry results alone, it is unclear whether selective dissolution of Alloy 22 components or generalized homogeneous dissolution with subsequent precipitation, adsorption, or use by bacteria of other alloying elements is occurring.

Although biological effects on coupon surfaces were demonstrable, the extent of MIC does not threaten the performance of the material over the anticipated repository lifetime.